

Segmentation:

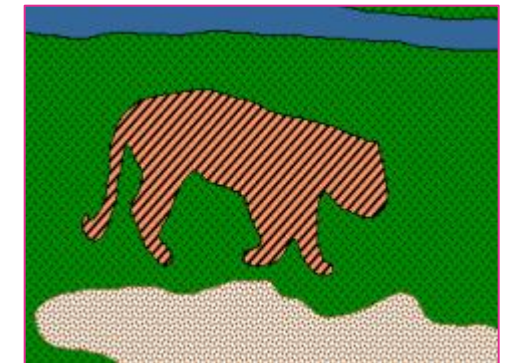
Thresholding

Dr. Tushar Sandhan

Introduction

■ Segmentation

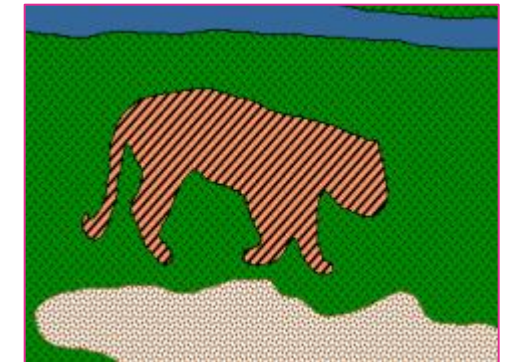
- aim: partition an image into set of pixels sharing common theme
 - coherent objects
 - flat structures
 - shapes



Introduction

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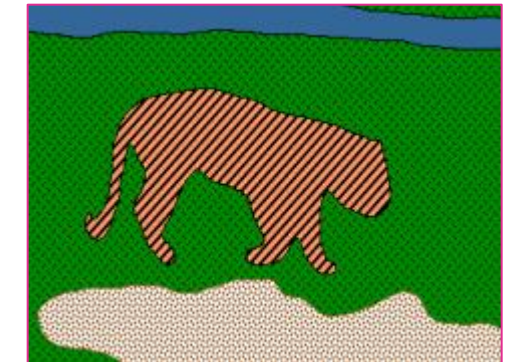
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Grouping by HVS

■ Gestalt

- config of things when integrated as to constitute a functional unit, with properties not derived by sum of its parts
- whole is greater than sum of parts
- relationship among parts are also imp. & can yield new properties
- gestalt factors: human psychology for groupism
- intuitive but difficult for algorithm

Grouping by HVS

■ Gestalt

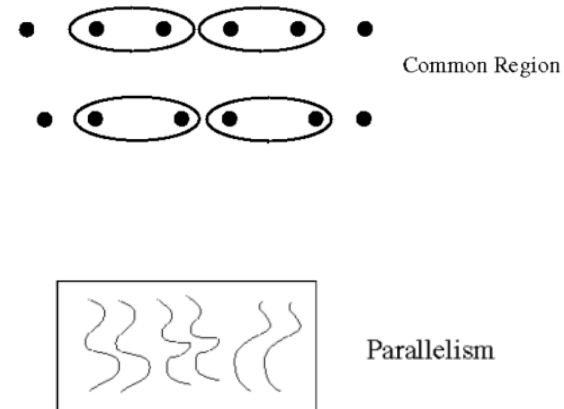
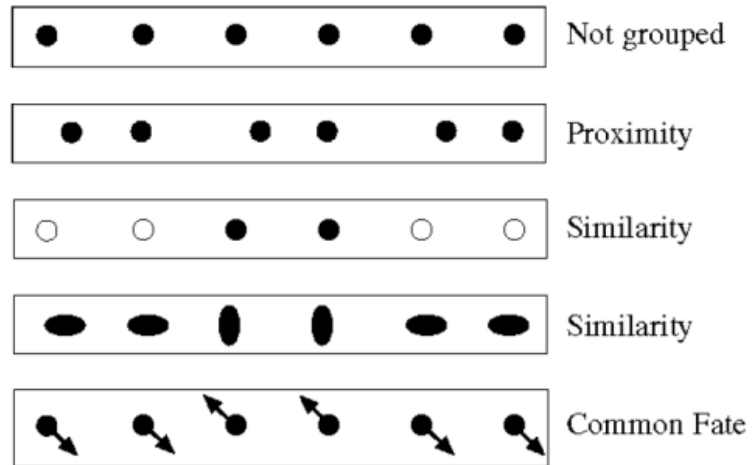
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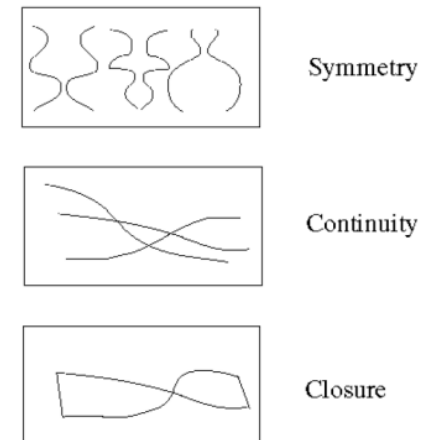
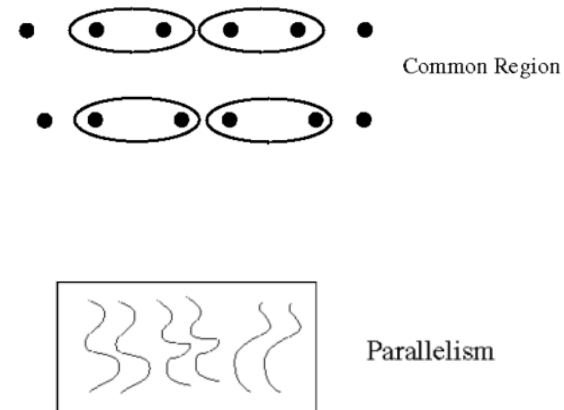
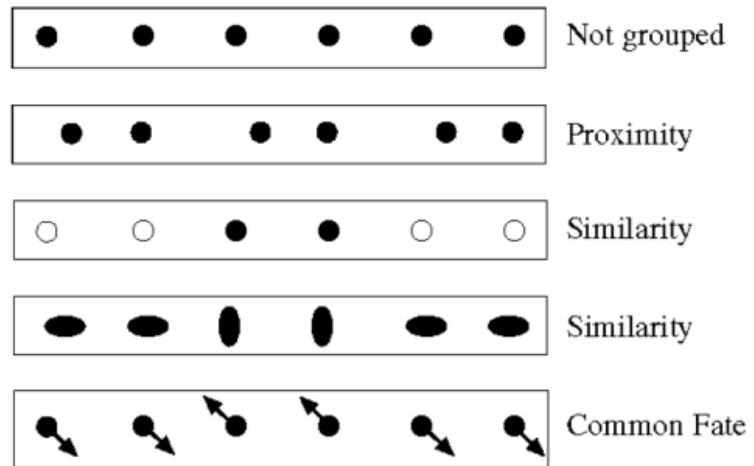
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Segmentation: grouping of pixels

- Pixels
 - points in high-dim space
 - gray: 1D
 - colors: 3D
 - location + colors: 5D
 - group pixels into segments or chunks



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- Grouping or similarity criterion

- intensity
- texture
- features
- histogram
- color



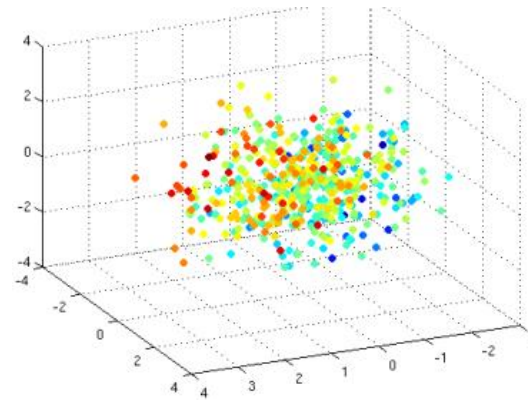
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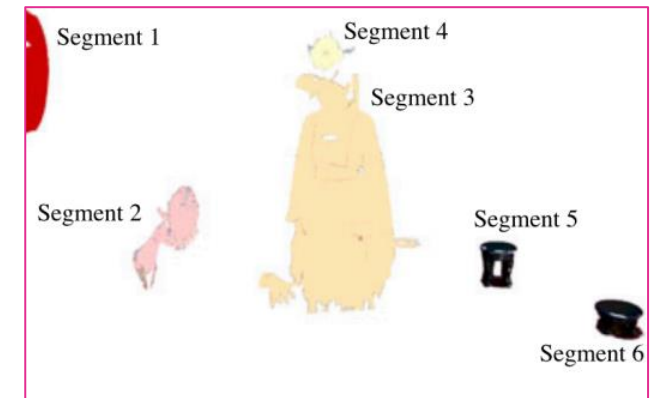
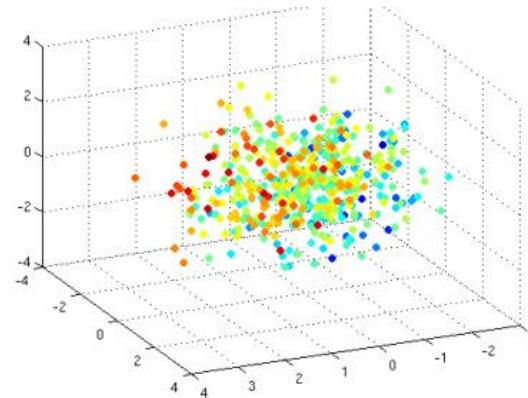
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Segmentation methods

- Shape based methods
- Thresholding
- Region based
 - region-growing

Segmentation methods

- Shape based methods
- Thresholding
- Region based
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- Machine learning based
 - Unsupervised
 - K-means clustering
 - mean shift clustering
 - Supervised
 - feature detection and learning
- Graph & energy minimization

Segmentation methods

- Shape based methods

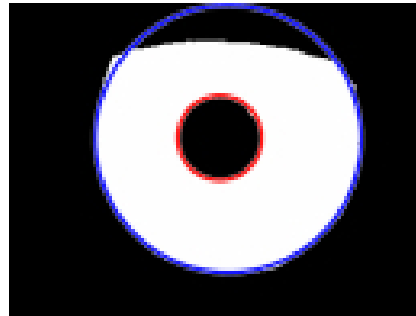
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Segmentation methods

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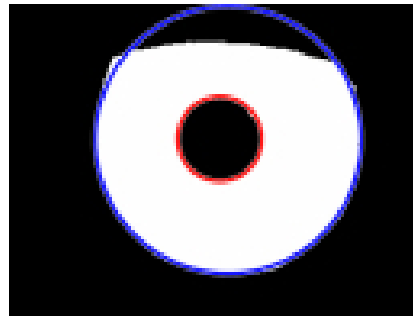
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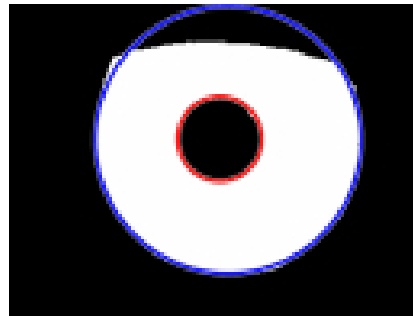
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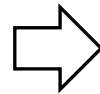


Thresholding

- Binarization or thresholding
 - quick and simple
 - partitions $f(x, y)$ into 2 sets: foreground & background using threshold T
 - can extend to multilevel T
 - assumptions:
 - intensities are different in different regions
 - intensities are similar within a segment
 - e.g. online poker

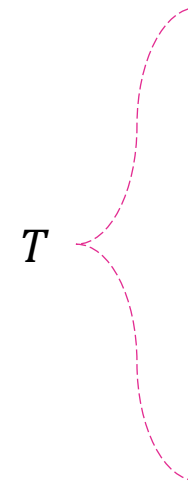
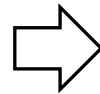
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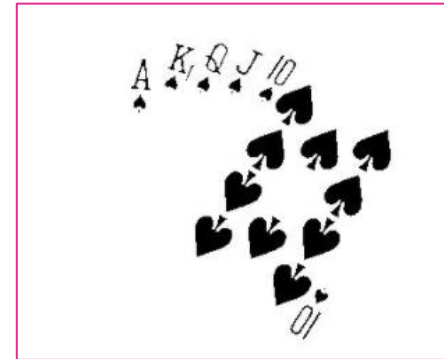
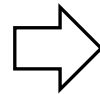
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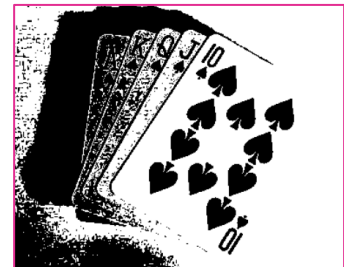


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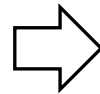


T



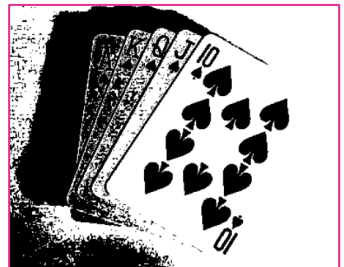
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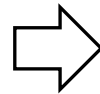
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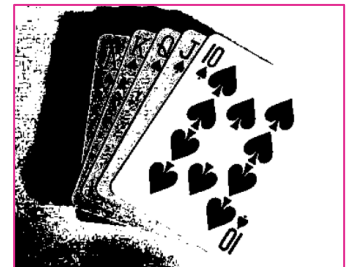


T

Low

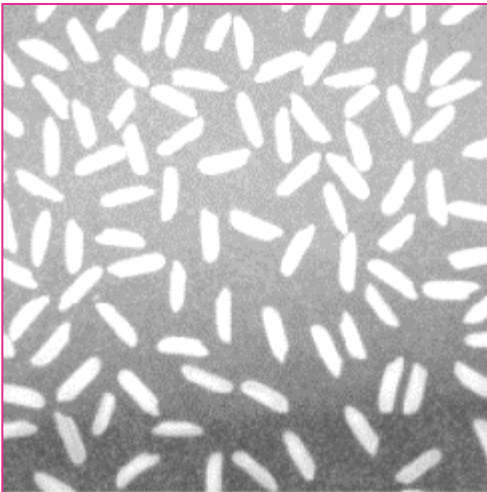


High



Thresholding

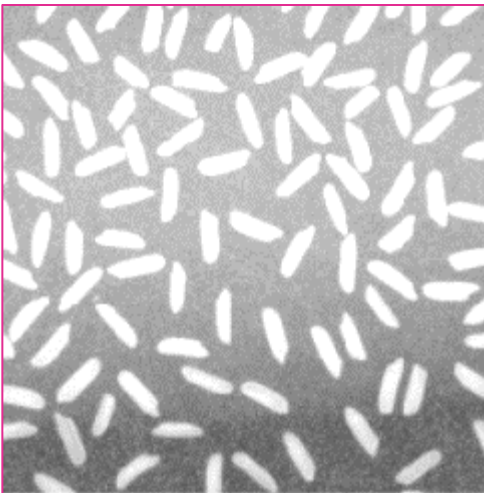
- Global: single T for entire image
- Local: blocking or tiling over the image & use different T for each block
- Adaptive: adjust or select T based on image content



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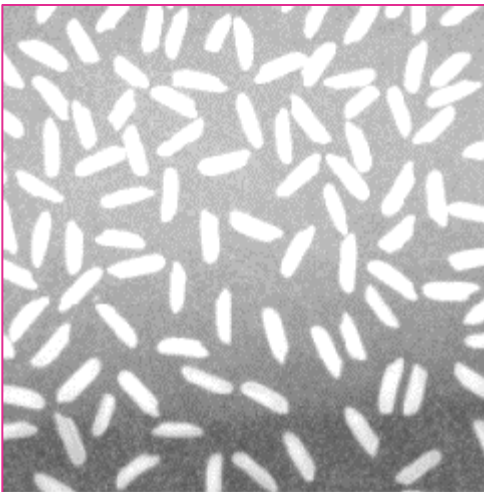
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global



local



Thresholding

- Global: iterative adapting threshold

-
- Initialize threshold T
 - Loop until converged
 - Partition image using T
 - Compute background mean μ_b as the average intensity of all pixels below T
 - Compute foreground mean μ_f as the average intensity of all pixels above T
 - Update T

$$T = \frac{1}{2}(\mu_f + \mu_b)$$

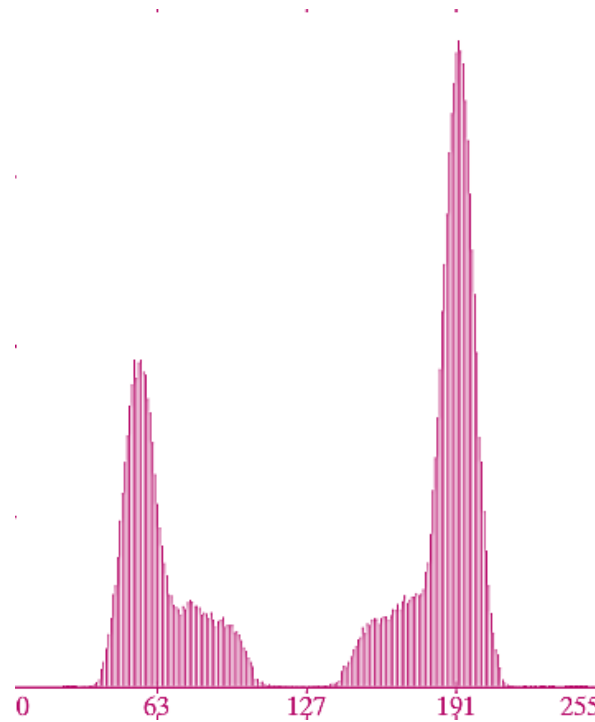
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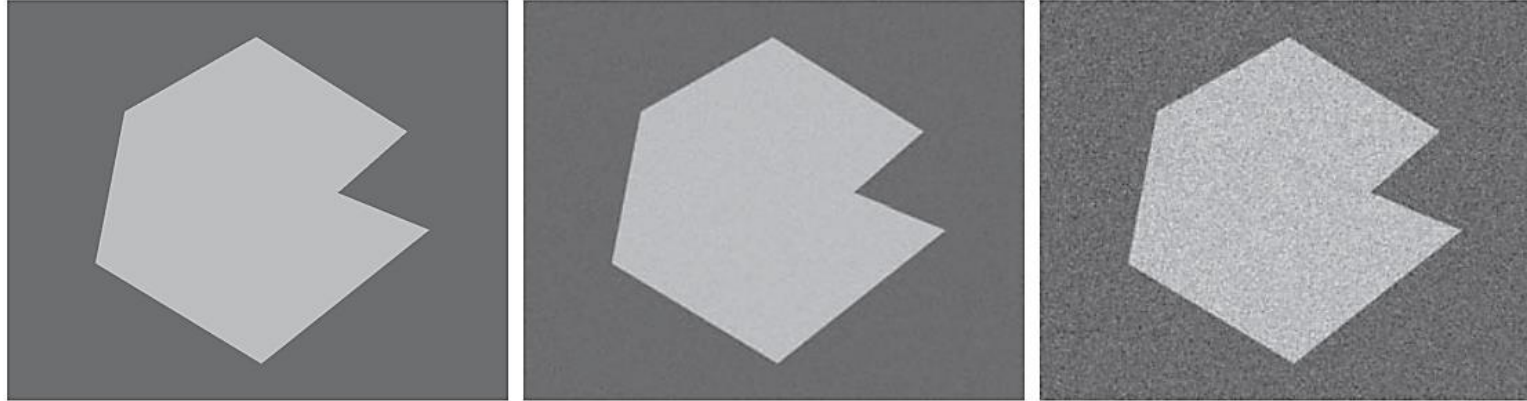
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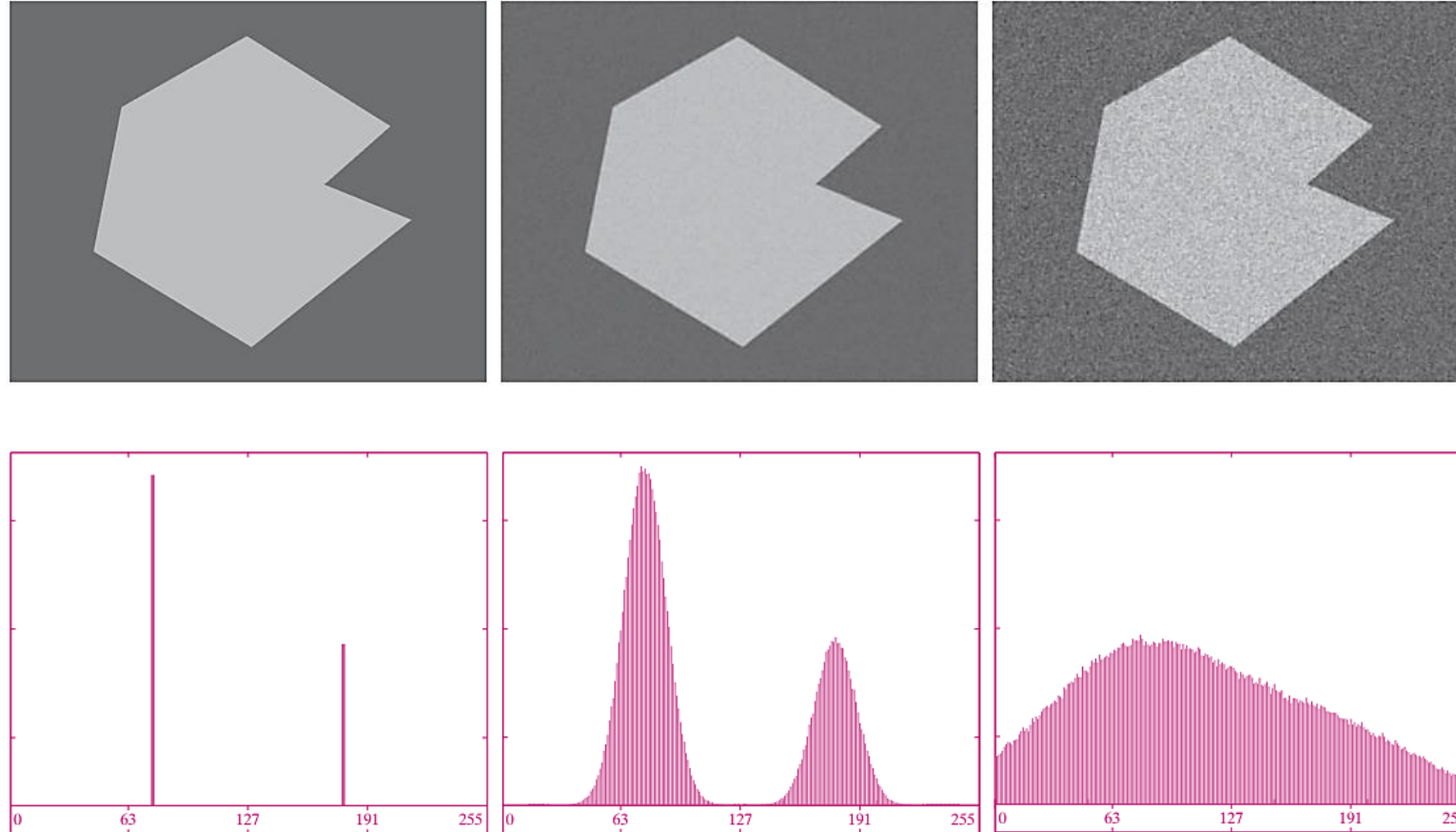
Thresholding

- Noise



Thresholding

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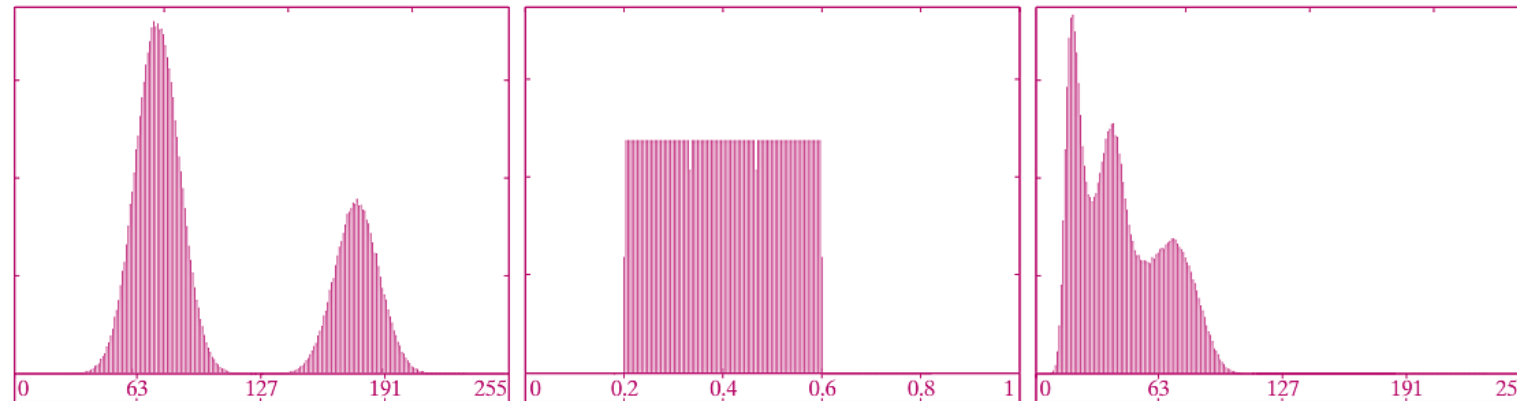
Thresholding

- Illumination
& reflectance



Thresholding

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Conclusion

- Segmentation
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- Thresholding
on handholding,
hand folding!

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